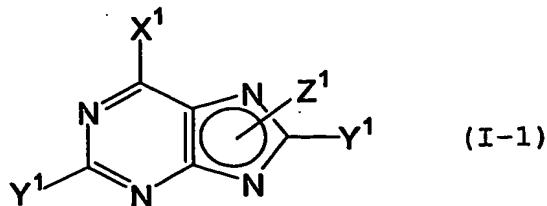


CLAIMS

1. A compound represented by the formula (I-1):



5 wherein

X¹ is an alkyl group, an alkoxy group, an aryl group, an optionally protected amino group, a halogen atom or a hydrogen atom,

one of Y¹

10 is a group represented by the formula: R-C≡C-

wherein R is a hydrogen atom, a hydrocarbon group optionally having substituents, an aryl group optionally having substituents or a heterocyclic group optionally having substituents, and the other

15 Y¹ is a hydrogen atom, and

Z¹ is an alkyl group, a sugar group, an amino-protecting group or a hydrogen atom, which is attached to a nitrogen atom at the 7- or 9-position of the purine nucleus,

20 or a salt thereof.

2. The compound of claim 1, wherein X¹ is a halogen atom, R is a hydrogen atom or Me₂(OH)C-, and Z¹ is an amino-protecting group or a hydrogen atom.

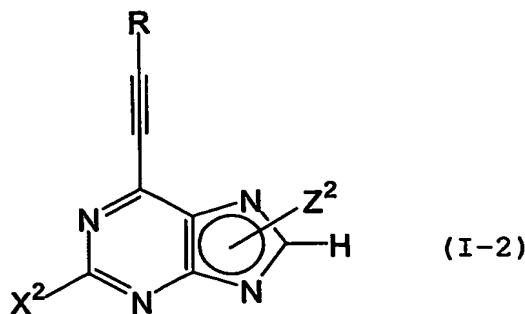
25

3. The compound of claim 1 or 2, wherein X¹ is a chlorine atom.

4. The compound of any of claims 1 to 3, wherein Z¹ is tetrahydropyran-2-yl, benzyl or a hydrogen atom.

30

5. A compound represented by the formula (I-2):



wherein

5 R is a hydrogen atom, a hydrocarbon group optionally having substituents, an aryl group optionally having substituents or a heterocyclic group optionally having substituents,

10 X² is an alkyl group, an alkoxy group, an aryl group, an optionally protected amino group, a halogen atom or a hydrogen atom, and

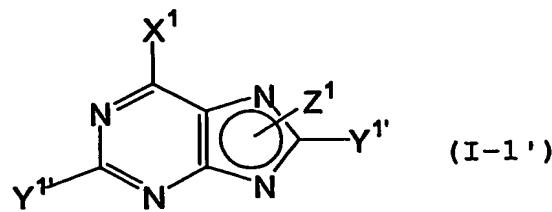
15 Z² is an alkyl group, a sugar group, an amino-protecting group or a hydrogen atom, which is attached to a nitrogen atom at the 7- or 9-position of the purine nucleus,

or a salt thereof.

6. The compound of claim 5, wherein R is a hydrogen atom or Me₂(OH)C-, X² is an optionally protected amino group, and Z² is an amino-protecting group or a hydrogen atom.

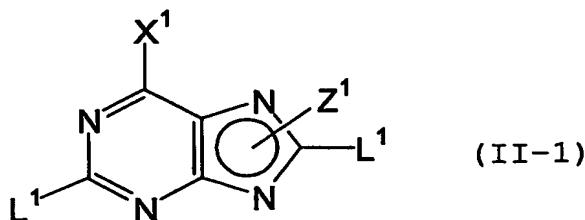
7. The compound of claim 5 or 6, wherein Z² is tetrahydropyran-2-yl, benzyl or a hydrogen atom.

25 8. A production method of a compound represented by the formula (I-1'):



wherein

X¹ is an alkyl group, an alkoxy group, an aryl group, an
 5 optionally protected amino group, a halogen atom or a hydrogen atom,
 Z¹ is an alkyl group, a sugar group, an amino-protecting group or a hydrogen atom, which is attached to a nitrogen atom at the 7- or 9-position of the purine nucleus, and
 10 one of Y¹ is a group represented by the formula: $\text{Me}_2(\text{OH})\text{C}-\text{C}\equiv\text{C}-$, and the other Y¹ is a hydrogen atom,
 or a salt thereof, which comprises reacting a compound represented by the formula (II-1):



15

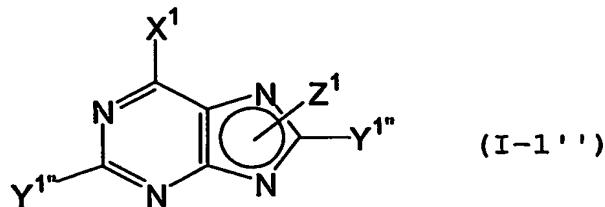
wherein

X¹ and Z¹ are as defined above, and
 one of L¹ is a halogen atom, and the other L¹ is a hydrogen atom, provided that when X¹ is a halogen atom, L¹ is a halogen
 20 atom having higher leaving ability than the halogen atom represented by X¹,
 or a salt thereof, with a compound represented by the formula (III): $\text{Me}_2(\text{OH})\text{C}-\text{C}\equiv\text{CH}$, in the presence of a metal catalyst and a base (1).

25

9. A production method of a compound represented by the

formula (I-1''):

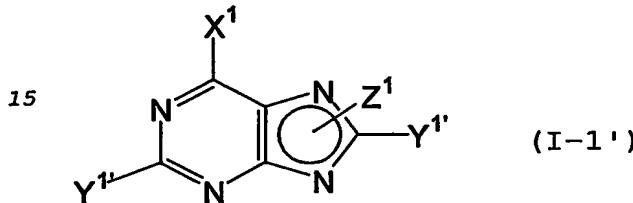


wherein

5 X¹ is an alkyl group, an alkoxy group, an aryl group, an optionally protected amino group, a halogen atom or a hydrogen atom,

Z¹ is an alkyl group, a sugar group, an amino-protecting group or a hydrogen atom, which is attached to a nitrogen atom at

10 the 7- or 9-position of the purine nucleus, and
one of Y¹'' is a group represented by the formula: HC≡C-, and
the other Y¹'' is a hydrogen atom, or a salt thereof, which
comprises treating a compound represented by the formula (I-
1'):



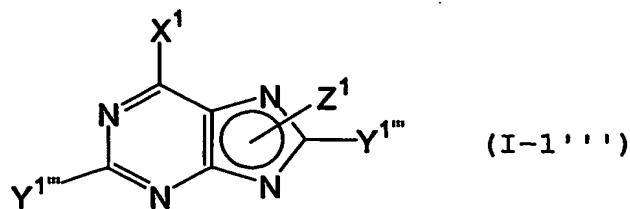
wherein

X¹ and Z¹ are as defined above, and

one of Y¹' is a group represented by the formula: Me₂(OH)C-C≡C-,

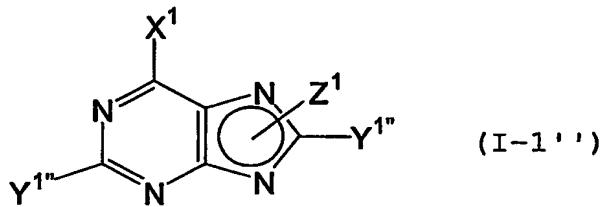
20 and the other Y¹' is a hydrogen atom,
or a salt thereof, with a base (2).

10. A production method of a compound represented by the
formula (I-1'''):



wherein

X¹ is an alkyl group, an alkoxy group, an aryl group, an
 5 optionally protected amino group, a halogen atom or a hydrogen atom,
 Z¹ is an alkyl group, a sugar group, an amino-protecting group or a hydrogen atom, which is attached to a nitrogen atom at the 7- or 9-position of the purine nucleus, and
 10 one of Y¹''' is a group represented by the formula: A-C≡C-, wherein A is an aryl group optionally having substituents or a heterocyclic group optionally having substituents, and the other Y¹''' is a hydrogen atom,
 or a salt thereof, which comprises reacting a compound
 15 represented by the formula (I-1''):

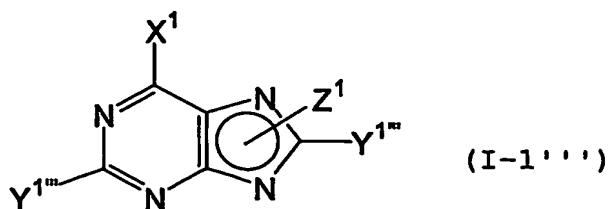


wherein

X¹ and Z¹ are as defined above, and
 20 one of Y¹'' is a group represented by the formula: HC≡C-, and the other Y¹'' is a hydrogen atom,
 or a salt thereof, with a compound represented by the formula (IV): A-X wherein A is as defined above, and X is a halogen atom, in the presence of a metal catalyst and a base (1).

25

11. A production method of a compound represented by the formula (I-1'''):



wherein

X¹ is an alkyl group, an alkoxy group, an aryl group, an
5 optionally protected amino group, a halogen atom or a hydrogen atom,

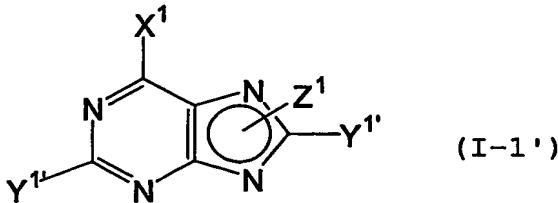
one of Y¹''' is a group represented by the formula: A-C≡C-,
wherein A is an aryl group optionally having substituents or a heterocyclic group optionally having substituents, and the
10 other Y¹''' is a hydrogen atom, and

Z¹ is an alkyl group, a sugar group, an amino-protecting group or a hydrogen atom, which is attached to a nitrogen atom at the 7- or 9-position of the purine nucleus,

or a salt thereof, which comprises the following steps (a) -

15 (c) :

(a) a step of obtaining a compound represented by the formula (I-1'):



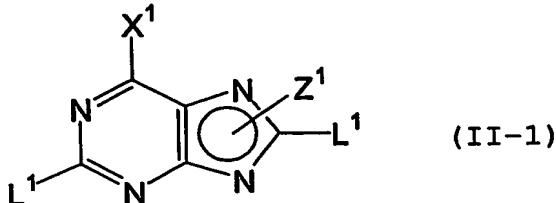
20 wherein

X¹ is an alkyl group, an alkoxy group, an aryl group, an optionally protected amino group, a halogen atom or a hydrogen atom,

Z¹ is an alkyl group, a sugar group, an amino-protecting group
25 or a hydrogen atom, which is attached to a nitrogen atom at the 7- or 9-position of the purine nucleus, and

one of Y¹' is a group represented by the formula: Me₂(OH)C-C≡C-,

and the other Y^1 is a hydrogen atom, or a salt thereof, which comprises reacting a compound represented by the formula (II-1):



5

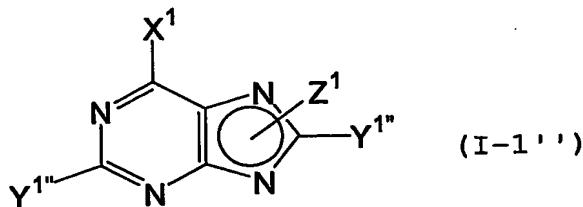
wherein

X^1 and Z^1 are as defined above, and

one of L^1 is a halogen atom, and the other L^1 is a hydrogen atom, provided that when X^1 is a halogen atom, L^1 is a halogen atom having higher leaving ability than the halogen atom represented by X^1 ,

or a salt thereof, with a compound represented by the formula (III): $Me_2(OH)C-C\equiv CH$, in the presence of a metal catalyst and a base (1),

15 (b) a step of obtaining a compound represented by the formula (I-1''):



wherein

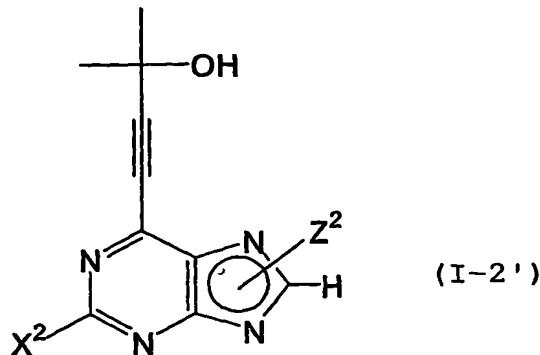
20 X^1 and Z^1 are as defined above, and

one of $Y^{1''}$ is a group represented by the formula: $HC\equiv C-$, and the other $Y^{1''}$ is a hydrogen atom, or a salt thereof, which comprises treating a compound of the formula (I-1') obtained in the step (a) or a salt thereof with a base (2), and

25 (c) a step of reacting a compound of the formula (I-1'') obtained in the step (b) or a salt thereof, with a compound represented by the formula (IV): $A-X$ wherein A is an aryl

group optionally having substituents or a heterocyclic group optionally having substituents, and X is a halogen atom, in the presence of a metal catalyst and a base (1).

5 12. A production method of a compound represented by the formula (I-2'):

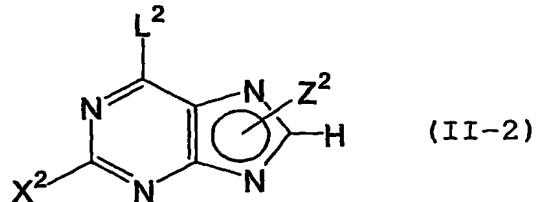


wherein

X² is an alkyl group, an alkoxy group, an aryl group, an 10 optionally protected amino group, a halogen atom or a hydrogen atom, and

Z² is an alkyl group, a sugar group, an amino-protecting group or a hydrogen atom, which is attached to a nitrogen atom at the 7- or 9-position of the purine nucleus,

15 or a salt thereof, which comprises reacting a compound represented by the formula (II-2):



wherein

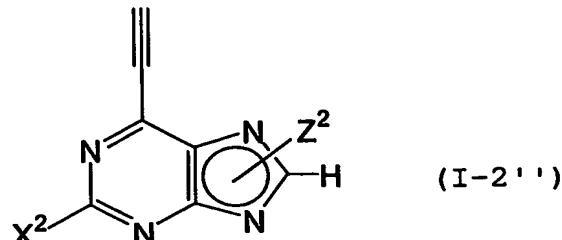
20 X² and Z² are as defined above, and

L² is a halogen atom, provided that when X² is a halogen atom,

L² is a halogen atom having higher leaving ability than the halogen atom represented by X², or the same halogen atom as X², or a salt thereof, with a compound represented by the formula

(III): $\text{Me}_2(\text{OH})\text{C}-\text{C}\equiv\text{CH}$, in the presence of a metal catalyst and a base (1).

13. A production method of a compound represented by the
5 formula (I-2''):

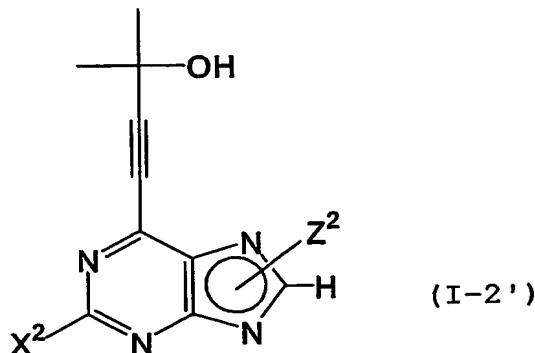


wherein

X² is an alkyl group, an alkoxy group, an aryl group, an
10 optionally protected amino group, a halogen atom or a hydrogen
atom, and

Z² is an alkyl group, a sugar group, an amino-protecting group
or a hydrogen atom, which is attached to a nitrogen atom at
the 7- or 9-position of the purine nucleus,

15 or a salt thereof, which comprises treating a compound
represented by the formula (I-2'):

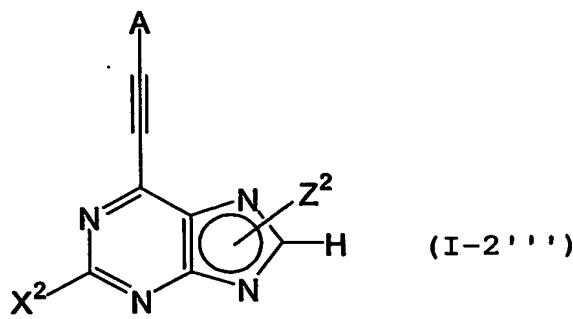


wherein

X² and Z² are as defined above,

20 or a salt thereof, with a base (2).

14. A production method of a compound represented by the
formula (I-2'''):



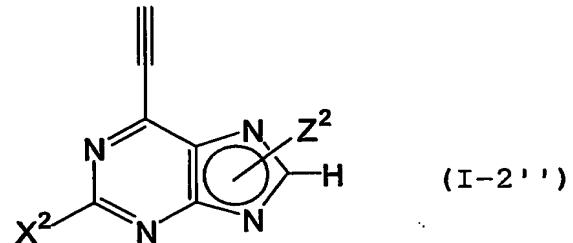
wherein

A is an aryl group optionally having substituents or a heterocyclic group optionally having substituents,

5 X² is an alkyl group, an alkoxy group, an aryl group, an optionally protected amino group, a halogen atom or a hydrogen atom, and

Z² is an alkyl group, a sugar group, an amino-protecting group or a hydrogen atom, which is attached to a nitrogen atom at

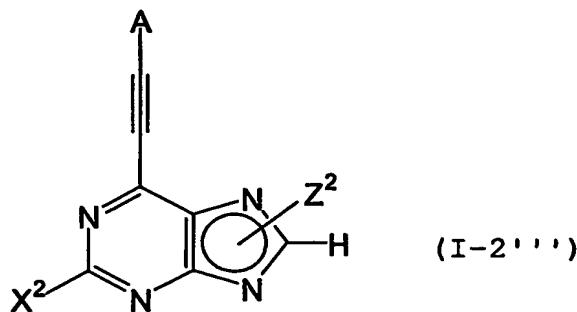
10 the 7- or 9-position of the purine nucleus,
or a salt thereof, which comprises reacting a compound represented by the formula (I-2''):



wherein

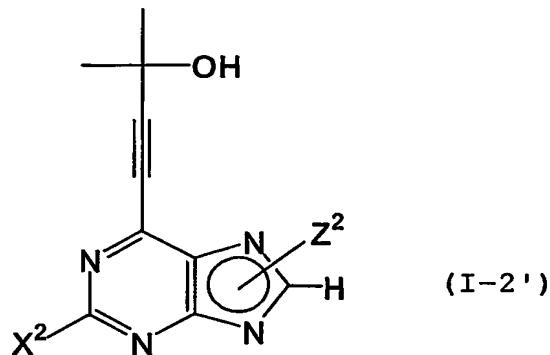
15 X² and Z² are as defined above,
or a salt thereof, with a compound represented by the formula (IV): A-X, wherein A is as defined above, and X is a halogen atom, in the presence of a metal catalyst and a base (1).

20 15. A production method of a compound represented by the formula (I-2'''):



wherein

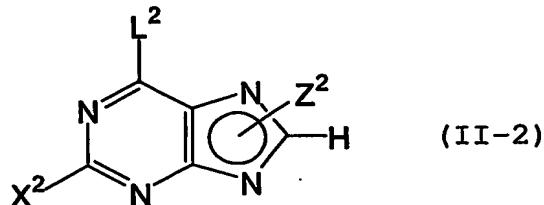
A is an aryl group optionally having substituents or a
 5 heterocyclic group optionally having substituents,
 X² is an alkyl group, an alkoxy group, an aryl group, an
 optionally protected amino group, a halogen atom or a hydrogen
 atom, and
 Z² is an alkyl group, a sugar group, an amino-protecting group
 10 or a hydrogen atom, which is attached to a nitrogen atom at
 the 7- or 9-position of the purine nucleus,
 or a salt thereof, which comprises the following steps (a) -
 (c) :
 (a) a step of obtaining a compound represented by the formula
 15 (I-2') :



wherein

X² is an alkyl group, an alkoxy group, an aryl group, an
 optionally protected amino group, a halogen atom or a hydrogen
 20 atom, and
 Z² is an alkyl group, a sugar group, an amino-protecting group
 or a hydrogen atom, which is attached to a nitrogen atom at

the 7- or 9-position of the purine nucleus, or a salt thereof, which comprises reacting a compound represented by the formula (II-2):



5 wherein

X² and Z² are as defined above, and

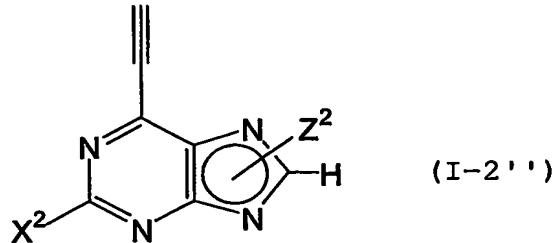
L² is a halogen atom, provided that when X² is a halogen atom,

L² is a halogen atom having higher leaving ability than the halogen atom represented by X², or the same halogen atom as X²,

10 or a salt thereof, with a compound represented by the formula

(III): $\text{Me}_2(\text{OH})\text{C}-\text{C}\equiv\text{CH}$, in the presence of a metal catalyst and a base (1),

(b) a step of obtaining a compound represented by the formula (I-2''):



wherein

X² and Z² are as defined above,

or a salt thereof, which comprises treating a compound of the

20 formula (I-2') obtained in the step (a) or a salt thereof, with a base (2), and

(c) a step of reacting a compound of the formula (I-2'') obtained in the step (b) or a salt thereof, with a compound represented by the formula (IV): A-X, wherein A is an aryl group optionally having substituents or a heterocyclic group 25 optionally having substituents, and X is a halogen atom, in

the presence of a metal catalyst and a base (1).

16. The production method of any of claims 8, 10, 11, 12, 14 and 15, wherein the metal catalyst is a palladium compound.

5

17. The production method of any of claim 8, 10, 11, 12, 14 and 15, wherein the metal catalyst is a combination of a palladium compound and a copper compound.

10 18. The production method of claim 16 or 17, wherein the palladium compound is bis(triphenylphosphine)palladium dichloride or tetrakis(triphenylphosphine)palladium.

19. The production method of claim 17, wherein the copper
15 compound is at least one selected from cuprous iodide, cuprous bromide and cuprous chloride.

20. The production method of any of claims 8, 10, 11, 12, 14 and 15-19, wherein the base (1) is an amine compound.

20

21. The production method of claim 20, wherein the amine compound is trialkylamine.

22. The production method of claim 21, wherein the
25 trialkylamine is triethylamine or ethyldiisopropylamine.

23. The production method of any of claims 9, 11, 13 and 15-22, wherein the base (2) is alkali metal hydroxide or alkali metal carbonate.

30